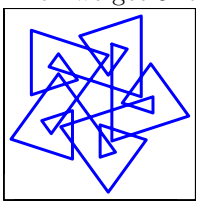
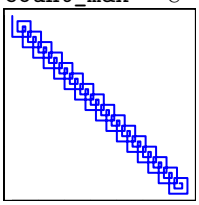
Name: Date:

How many loops will my countdown pattern have?

- Two key parameters that dictate the countdown pattern:
  - `turn_deg`: The turn angle (in degrees)
  - `count_max`: The countdown maximum (which is also number of segments per loop)
- From those, **can we predict how many loops are formed?**
- For example, if we set the parameters to the values below:
  - `turn_deg` = 108° which is equivalent to $\frac{3}{10}$ full turn
  - `count_max` = 6
  - Then we get 5 loops:



- Sometimes we can get infinity loops. For example:
  - `turn_deg` = 90° which is equivalent to $\frac{1}{4}$ full turn
  - `count_max` = 8



  - Notice, this pattern would continue forever, making `loops`=∞.
- As suggested before, it'll be useful to use **fraction of a full turn** instead of degrees. Some examples:

$$120^\circ = \frac{1}{3} \text{ full turn}$$

$$90^\circ = \frac{1}{4} \text{ full turn}$$

$$72^\circ = \frac{1}{5} \text{ full turn}$$

$$144^\circ = \frac{2}{5} \text{ full turn}$$

$$60^\circ = \frac{1}{6} \text{ full turn}$$

- In our new Scratch project, we will set the numerator and denominator of the turn fraction.
  - https://scratch.mit.edu/projects/1216750917
  - `turn_a` is the numerator (top of fraction)
  - `turn_b` is the denominator (bottom of fraction)
  - The computer will calculate `turn_deg` for you.

$$\texttt{turn\_deg} = 360^\circ \cdot \frac{\texttt{turn\_a}}{\texttt{turn\_b}}$$

  - You can use arrow keys (on keyboard) to adjust `turn_a`, `turn_b`, and `count_max`.
  - I have coded an automatic scaling and recentering, so you do not need to worry about those parameters.
  - You'll definitely want **Turbo Mode**, so make sure you "Look Inside".
- In order to find the prediction rule, record some results in tables.

Name: Date:

How many loops will my countdown pattern have?

turn a	turn b	count max	turn deg	loops
1	3	1		
1	3	2		
1	3	3		
1	3	4		
1	3	5		
1	3	6		
1	3	7		

turn a	turn b	count max	turn deg	loops
1	4	1		
1	4	2		
1	4	3		
1	4	4		
1	4	5		
1	4	6		
1	4	7		

turn a	turn b	count max	turn deg	loops
1	6	1		
1	6	2		
1	6	3		
1	6	4		
1	6	5		
1	6	6		
1	6	7		

Name: Date:

How many loops will my countdown pattern have?

turn a	turn b	count max	turn deg	loops
7	30	1		
7	30	2		
7	30	3		
7	30	4		
7	30	5		
7	30	6		
7	30	7		
7	30	8		
7	30	9		
7	30	10		
7	30	11		
7	30	12		
7	30	13		
7	30	14		
7	30	15		
7	30	16		
7	30	17		
7	30	18		

What's the rule?

- **What rule dictates the number of loops?**

Name: Date:

How many loops will my countdown pattern have?

- On this page, please record some parameter settings that you feel produce aesthetically pleasing results.
- Or, use this page to continue investigating the rule that dictates the number of loops.

turn a	turn b	count max	turn deg	loops	comments